REMARKS

Claims 1-6 are present in this application. Claims 1 and 2 are independent.

Statement of Interview

The Examiner is thanked for conducting the interview on February 15, 2005. It is believed that as a result of the interview, the Examiner has a better understanding of the present invention and Applicant has a better understanding of the Examiner's position.

In particular, as a result of the interview, it is Applicant's understanding that the Examiner agrees that Miyoshi's hole 45 does not appear to be a slit, since it is explicitly stated in the specification at column 4, line 28, as being a "hole", while items 46a and 46b are stated as being "straight slits" (col. 4, lines 29-31).

Claim Rejection – 35 U.S.C. § 103; Miyoshi

Claim 1

Claim 1 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Prior Art disclosed in the present application in view of U.S. Patent 4,897,536 (Miyoshi). Applicant traverses this rejection.

Claim 1 is directed to embodiments of a triangulation-type optical displacement sensor. Among other things, a source light-emitting element (e.g., light-emitting element 11) emits a light beam that is narrowed by a slit (e.g., slit 13) and projected onto the distance measurement

target. Light diffusely reflected by distance measurement target is narrowed by a slit (e.g., slit 14) and guided to a light-receiving surface (e.g., light-receiving surface 12a).

Because the location and size of the slit for the light-emitting element can be set for the size of the spot to be projected onto the distance measurement target, the distance between the slit and the light-emitting element can be made short. Also, because the size of the slit is small, the overall size of the displacement sensor can be made small. (Present specification at paragraph 0014.)

Thus, according to claim 1, the triangulation-type optical displacement sensor includes, among other things, at least one slit for narrowing at least one light beam projected toward at least one of the distance measurement targets, and the at least one slit for narrowing at least a portion of the light reflected from the at least one of the distance measurement targets.

The Final Office Action again relies on prior art disclosed in the present application for teaching features of the claimed invention except for the feature of at least one slit for narrowing at least one light beam projected toward at least one distance measurement target, and at least one slit for narrowing at least a portion of the light reflected from said at least one of the distance measurement target. The Final Office Action instead relies on Miyoshi (primarily Fig. 4) for teaching the missing elements of the disclosed prior art. In particular, the Final Office Action maintains that Miyoshi's item 45 constitutes the claimed "at least one slit for narrowing one light beam projected toward at least one of the distance measurement targets."

Applicant submits that Miyoshi explicitly discloses item 45 as being a hole 45 of about 3mm diameter (col. 4, lines 27-28, which states "Like convex lens 41, light shielding plate 44

has a hole 45 of about 3 mm diameter on optical axis 42."), and explicitly refers to items 46a and 46b in light shielding plate 44 as being "two parallel straight slits 46a and 46b." Thus, Applicant submits that Miyoshi's hole 45 of about 3 mm does not teach the claimed "at least one slit for narrowing one light beam projected toward at least one of the distance measurement targets."

Thus, Applicant submits that Miyoshi in combination with the prior art disclosed in the present application fails to teach each and every claimed element.

In addition, Applicants submit that there is no motivation to combine the prior art triangulation-type optical displacement sensor of the disclosed prior art with the teachings of Miyoshi. The Office Action states that

> "Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to combine a triangulation-type optical displacement sensor of PAPI with at least one slit for narrowing at least one light beam projected toward at least one of the distance measurement targets, and said at least one slit for narrowing at least a portion of the light reflected from said at least one of the distance measurement targets as taught by Miyoshi for the purpose of reducing or narrowing bandwidth wavelength for measuring high accurate the displacement of a target surface in wide range." (Office Action at page 4).

First of all, Applicant submits that Miyoshi fails to teach a slit for narrowing at least one light beam projected toward at least one of the distance measurement targets. As noted above, Miyoshi specifically discloses a hole 45 of about 3mm diameter on optical axis 42, as distinguished from straight slits 46a, 46b. Also, Miyoshi does not disclose narrowing of a beam bandwidth to obtain accurate measurement of displacement, as alleged in the Office Action.

Secondly, Miyoshi teaches away from a triangulation-type optical displacement sensor.

It is improper to combine references where the references teach away from their combination. In re Grasselli, 713 F.2d 731, 743, 218 USPQ 769, 779 (Fed. Cir. 1983). See M.P.E.P. § 2145.

Miyoshi discloses that the triangulation method is unsuitable for measurement of distances from three-dimensional surfaces, in that the triangulation technique can result in measurement error when a "shadow effect" occurs (as shown in Fig. 3 of Miyoshi). Figure 4 of Miyoshi, primarily relied on in the Office Action, shows a solution to the problem of "shadow effect." The arrangement shown in Fig. 4 shows a knife-edge-type positioning sensor. The arrangement shown in Fig. 4 represents an improvement over prior art knife-edge positioning sensors, which have drawbacks discussed in col. 2, line 40, to col. 3, line 15 of Miyoshi.

Because Miyoshi teaches away from the triangulation method, it would not be proper to combine teachings of Miyoshi's knife-edge type positioning sensor with the triangulation-type optical displacement sensors of the disclosed prior art.

At least for the above reasons, Applicant submits that it would not have been obvious to one of ordinary skill in the art to combine a triangulation-type optical displacement sensor of the disclosed prior art with teachings of the knife-edge-type displacement sensor of Miyoshi in order to reduce and narrow bandwidth wavelength for measuring with high accuracy the displacement of a target surface in wide range. Accordingly, Applicant submits that the rejection fails to establish *prima facie* obviousness and requests that the rejection be reconsidered and withdrawn.

Claim Rejection – 35 U.S.C. § 103; Rudd, Breyer

Claim 2

Claim 2 has been rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent 5,519,204 (Rudd) in view of U.S. Patent 5,065,526 (Breyer). Applicant traverses this rejection.

Claim 2 is directed to embodiments of a triangulation-type optical displacement sensor. The triangulation-type optical displacement sensor includes at least one light-receiving element for receiving at least a portion of the light reflected from at least one of the distance measurement targets and being disposed such that at least one light-receiving surface is substantially perpendicular to at least one optical axis of at least a portion of the projected light. The triangulation-type optical displacement sensor of claim 2 includes, among other things, at least one straight and narrow slit for narrowing at least one light beam projected toward at least one of the distance measurement targets, and at least one light collecting element collecting at least a portion of the light reflected from the at least one of the distance measurement targets.

The Office Action relies on Rudd for teaching a triangulation-type displacement system, but admits that it does not disclose at least one slit for narrowing the light beam towards the target. Instead, the Office Action relies on Breyer for teaching the missing element.

Rudd

Rudd is directed to exposure control in light-based measurement instruments ("Title"), and in particular exposure control in CCD-based instruments ("Summary of the Invention"). An embodiment shown in Fig. 2 is a triangulation range sensing system. A diode laser 18, focusing

lens 20, receiver optics 22 and detector 24 are mounted inside a case. Light from the diode laser 18 is focused to a small spot (typically 25μm) on an object. Reflected light 21 from the object passes through the receiver optics and is finally focused to image spot 23 (typically 400μm) on a CCD array detector 24. (col. 4, lines 6 – 25). Rudd discloses that the diode laser 18 and detector 24 are coupled to electronics mounted on a printed circuit board inside case 16 (col. 4, lines 10-13).

Differences over Rudd

Unlike the invention of claim 2, Rudd's detector 24 is not disclosed as being substantially perpendicular to the optical axis from the laser diode 18. Thus, Rudd does not teach at least one light-receiving surface that is substantially perpendicular to at least one optical axis of a portion of projected light. Furthermore, as admitted in the Office Action, Rudd fails to teach a slit for narrowing a light beam projected toward the distance measurement target.

Differences over Breyer

The Office Action states that Breyer teaches at least one aperture (23 of fig. 3) for narrowing at least one light beam projected toward at least one distance measurement target (citing col. 4, lines 20-32). Furthermore, the Office Action states that Breyer allegedly teaches the claimed at least one slit for narrowing at least one light beam projected toward at least one of the distance measurement targets "for the purpose of reducing light transmitting with measuring high accurate the displacement of a target surface." Applicant disagrees.

Breyer is completely silent as to a function of narrowing of a light beam projected toward the distance measurement target for the purpose of reducing transmitted light in order to obtain

highly accurate measurement of displacement. Instead Breyer merely discloses that, "the triangulation sensor has a laser diode 28 from which a measuring point is projected through aperture 23 onto the object 10 to be measured" (col. 4, lines 23-26). No other information is disclosed concerning aperture 23, and furthermore Breyer does not teach or suggest that the aperture reduces light for producing highly accurate measurement of displacement.

Still further, Breyer discloses a conventional triangulation sensor as an optional probe head (described with reference to Fig. 3 at col. 4, lines 19-31) that includes a temperature sensor in the form of a measuring resistor 27 used in order to correct for errors in measurement (col. 4, lines 32-56). Breyer simply does not disclose reducing light transmitted for producing highly accurate measurement of displacement of a target surface, as alleged in the Office Action.

In addition, Applicant submits that one of ordinary skill in the art would not consider Breyer's aperture 23 as constituting a "slit". Breyer's Fig. 3a clearly shows aperture 23 as being a circular opening. A slit, on the other hand, is by definition a straight and narrow opening. In order to clarify this distinction, claim 2 has been amended to explicitly recite the definition of slit, as a "straight and narrow slit." Applicant submits that Breyer's circular aperture 23 does not teach or suggest the claimed straight and narrow slit.

Thus, Applicant submits that Breyer does not teach or suggest the claimed at least one straight and narrow slit for narrowing at least one light beam projected toward at least one of the distance measurement targets.

Combination of Rudd and Breyer

As Rudd fails to teach at least one light-receiving surface that is substantially perpendicular to at least one optical axis of a portion of projected light, as well as the claimed at least one straight and narrow slit for narrowing a light beam, and Breyer also does not teach the claimed at least one straight and narrow slit for narrowing a light beam, Applicant submits that the rejection fails to establish *prima facie* obviousness for claim 2. Accordingly, Applicant requests reconsideration and withdrawal of the rejection.

Claim Rejection – 35 U.S.C. § 103; Miyoshi, Reichard

Claim 4

Claim 4 is rejected under 35 U.S.C. § 103(a) as being unpatentable over the prior art disclosed in the present application in view of Miyoshi, and further in view of U.S. Patent 3,740,563 (Reichard). Applicant traverses this rejection.

The same arguments as in the above for claim 1 apply as well to claim 4. At least for the reasons above for claim 1, Applicant submits that the rejection fails to establish *prima facie* obviousness for claim 4.

Claim 4 is directed to the arrangement of claim 1 and the further feature of a filter arranged at an exit side of at least one of the slits narrowing at least one of the light beams projected toward at least one of the distance measurement targets, and the at least one filter being arranged at the incident side of said at least one of the slits narrowing at least a portion of the light reflected from at least one of the distance measurement targets.

The Office Action relies on Reichard for teaching the filters recited in claim 4. The Office Action states that Reichard teaches that it is known in the art to provide at least one filter (31 of Fig. 1A) being arranged at an exit side of at least one slit (34 of figure 1A) for narrowing the at least one of the light beams projected toward at least one of the distance measurement targets. As a motivation, the Office Action provides that the combination would have been obvious "for the purpose of filtering or reducing noise [in a] light system." (words added for clarity) Applicant disagrees.

First of all, Reichard discloses an electroptical system for controlling the diameter of crystals pulled from a melt. Reichard does not disclose any type of displacement sensor. Thus, Applicant submits that Reichard is not analogous prior art. In addition, Reichard's system for controlling the diameter of pulled crystals is not pertinent to the particular problem with which the present inventor is concerned. See M.P.E.P. § 2141.01(a).

Second, the filters disclosed in Reichard are "heat-reflecting optical filters" 31a and 31b, which preferentially block most of the longer-wavelength infrared radiation from the hot melt, crucible, and susceptor, in order to shield the optics chamber 17 from excessive heat and also discriminate preferentially in favor of the shorter wavelength tungsten-filament bulb illumination spectrum (col. 7, lines 4-11). Applicants submit that one of ordinary skill would not look to combine such heat-reflecting optical filters with the displacement sensor of Miyoshi, as well as the disclosed prior art.

Third, the optical filters 31a and 31b of Reichard, being for blocking infrared radiation, are not of the type for filtering or reducing noise, as alleged in the Office Action.

Accordingly, Applicant submits that insufficient evidence of a motivation to combine Reichard is present and the rejection fails to establish *prima facie* obviousness for claim 4. Applicant requests that the rejection be reconsidered and withdrawn.

Claim Rejection – 35 U.S.C. § 103; Rudd, Breyer, Ikari

Claim 3

Claim 3 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Rudd, Breyer, and further in view of U.S. Patent No. 4,864,147 (Ikari). Applicant traverses this rejection.

The rejection of claim 3 relies on Ikari for teaching the claimed cylindrical lens. However, the same differences over Rudd and Breyer as in claim 2 apply as well to claim 3. Applicant requests reconsideration and withdrawal of the rejection.

Claim Rejection – 35 U.S.C. § 103; Rudd, Breyer, Reichard

Claims 5 and 6

Claims 5 and 6 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Rudd, Breyer, Ikari and Reichard. Applicant traverses this rejection.

The same arguments as in the above for claim 2 apply as well to claims 5 and 6. At least for the reasons above for claim 2, Applicant submits that the rejection fails to establish *prima facie* obviousness for claims 5 and 6.

Claim 5 is directed to the arrangement of claim 2 and the further feature of a filter arranged at an exit side of at least one of the slits narrowing at least one of the light beams

projected toward at least one of the distance measurement targets. Claim 6 is directed to the same further feature in the arrangement of claim 3.

The Office Action relies on Reichard for teaching the filters recited in claims 5 and 6. The Office Action states that Reichard teaches that it is known in the art to provide at least one filter (31 of Fig. 1A) being arranged at an exit side of at least one slit (34 of figure 1A) for narrowing the at least of the light beams projected toward at least one of the distance measurement targets. As a motivation, the Office Action provides that the combination would have been obvious "for the purpose of filtering or reducing noise [in a] light system." (words added for clarity) Applicant disagrees.

The same arguments as above for claim 4 applies as well to claims 5 and 6.

Accordingly, Applicant submits that insufficient evidence of a motivation to combine Reichard is present and the rejection fails to establish *prima facie* obviousness for claims 5 and 6. Applicant requests that the rejection be reconsidered and withdrawn.

Conclusion

In view of the above amendment, Applicant believes the pending application is in condition for allowance.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Robert W. Downs (Reg. No. 48,222) at the telephone number of (703) 205-8000, to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

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Respectfully submitted,

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